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First Record of *Iotabrycon praecox* Roberts 1973 (Characidae: Stevardiinae) in the Santa Rosa Drainage, Southwestern Ecuador

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ABSTRACT: *Iotabrycon praecox* (Characidae: Stevardiinae) has been reported as endemic to the Guayas River drainage in Western Ecuador since its description in 1973. We collected one specimen of *I. praecox* in the Santa Rosa River, Santa Rosa drainage, El Oro Province, approximately 144 km south of the Guayas drainage, significantly expanding the known geographic distribution of the species. Given the severe anthropomorphic pressures impacting fishes in Southwestern Ecuador, there is an urgent need to evaluate the present status of *I. praecox* in the region.

Iotabrycon is a monotypic characid genus thought to be endemic to the Guayas River drainage in Western Ecuador (Roberts 1973; Barriga 2012). Along with two other monotypic genera in the drainage, *Landonia* and *Phenacobrycon*, it was formerly classified in the subfamily Glandulocaudinae based on the presence of specialized pheromone-producing basal caudal-fin organs in males (Géry 1977; Weitzman and Fink 1985; Weitzman 2003). *Iotabryon* was further placed in the tribe Xenurobryconini with the allopatric genera *Argopleura, Scopaeocharax, Tyttocharax*, and *Xenurobrycon* based on synapomorphies associated with the caudal fin organ and pelvic fin rays of sexually mature males (Weitzman and Fink 1985). Recent reviews of the Glandulocaudinae using both morphological and molecular data have restructured this subfamily and placed *Iotabrycon* and related genera in the subfamily Stevardiinae (Weitzman et al. 2005; Mirande 2009, 2010; Oliveira et al. 2011).

Iotabrycon praecox Roberts 1973 is the smallest characid in Western Ecuador, reaching a maximum size of about 22 mm standard length (Weitzman and Fink 1985). Males of *I. praecox* have the most elaborate caudal glands of any characid in the region and exhibit conspicuously large modified scales at the base of the caudal fin (Roberts 1973). *Iotabrycon praecox* also exhibits sexual dimorphism; females are larger than males but the caudal fin is larger in males. In addition, females have a small black spot on the base of the caudal fin while males have the modified scales of the caudal-fin organ (Roberts 1973). This species can be distinguished from other characids in the region by its lack of an adipose fin, the presence of conical teeth in a single row on the premaxilla (as opposed to multicuspid teeth in multiple rows), and differences in fin counts. In *I. praecox*, the dorsal-fin count is ii+7, the anal-fin count is iii+21 to v+23, the pectoral-fin count is 7-10, and the pelvic-fin count is 7 (Roberts 1973).

We report the collection of one specimen of *I. praecox* in the Santa Rosa drainage, a small coastal drainage approximately 144 km south of the Guayas drainage in El Oro province, Southwestern Ecuador. The specimen was deposited in the Museo Ecuatoriano de Ciencias Naturales (MECN-DP 2543). This is the first report of *I. praecox* in El Oro province. The finding is significant because it is the first record of the species outside of the Guayas drainage since its description and substantially expands the known range of this highly specialized, miniature characid. Unfortunately, Western Ecuador is heavily impacted by anthropogenic factors including habitat transformation for the development of agricultural fields and towns, the building of dams and creation of artificial reservoirs (*e.g.*, Aguirre *et al.* 2013), habitat deterioration due to pollution, mining and severe river bank modification, and heavy fishing pressure, making appraisal of the current status of *I. praecox* in the area all the more urgent.

The specimen collected (Figure 1) fit the original description for the species (Roberts 1973). It is a relatively large individual for the species, measuring 19.7 mm SL and it was identified as a male based on the presence of modified scales on the base of the caudal fin. The adipose fin is absent. Conical teeth are in a single row on the premaxilla. The dorsal-fin count is ii+7, the anal fin-count is iii+21 and the pectoral-fin count is 10. This combination of characters is not present in any other characids known in the region. All other small characids have an adipose fin and most have higher anal-fin counts. In addition, most other common small characids (*e.g.*, *Rhoadsia, Bryconamericus, Astyanax*) are deeper bodied. Similar Stevardiinae in the region, *Landonia latidens* Eigenmann and Henn 1914 and *Phenacobrycon henni* (Eigenmann 1914), have adipose fins, higher anal-fin counts and multicusped teeth in several rows on the premaxilla (Roberts 1973).

Figure 1. Preserved male of *Iotabrycon praecox* collected in the Santa Rosa River (MECN-DP 2543). Note lack of adipose fin and presence of modified scale covering caudal gland at the posterior end of the caudal peduncle that characterize this species. Scale bar indicates 10 mm.

The specimen of *I. praecox* (Figure 1) was collected during a survey of the Santa Rosa River just upstream of the city of Santa Rosa (Figure 2) conducted the morning of July 30, 2013 using a Smith Root LR24 Electrofisher backpack and seine. Sampling was conducted under permit 015-IC-FAN-DPEO-MAE from the Ministry of the Environment of Ecuador (El Oro province). The sampling site was located at 3°30′06″ S and 29°57′25″ W, approximately 31 m above sea level and it is in an area that is heavily impacted by human influences. A rural road crosses the river just a few meters from the sampling site and the river is surrounded by farmland with no forest cover visible from the sampling site. A wire fence crosses the river a few meters downstream of the sampling site. The specimen of *I. praecox* was collected in a small patch of shallow riffle habitat approximately 24.5 m in length located between areas of deeper slow running water (Figure 3). At the time of collection, mean water depth was 27cm, velocity was 0.086 m/s, water temperature was 22.1°C, salinity was 0.1 ppt, conductivity was 150.2 µS, oxygen was at saturation (8.26 mg/L) and the bottom consisted primarily of cobble with leaves and some sand and gravel. Twelve other fish species that are relatively common in low lying fresh waters in the region were also collected. These included other characiforms like *Brycon atrocaudatus* (Kner 1863), *Bryconamericus brevirostris* Gunther 1859, *Bryconamericus peruanus* (Muller and Troschel 1845), *Rhoadsia altipinna* Fowler 1911, and *Saccodon wagneri* Kner 1863, siluriforms like *Pimelodella modestus* (Gunther 1860), *Chaetostoma aequinoctiale* Pellegrin 1909, and *Ancistrus clementinae* Rendahl 1937, the cichlids *Andinoacara rivulatus* (Gunther 1860) and *Cichlasoma festae* (Boulenger 1899), and the poeciliids *Poecilia* sp. and *Pseudopoecilia* sp.. Small *Chaetostoma* below 50 mm SL were particularly abundant at this site.

Our sampling efforts in the stream were relatively intense. This site at which the specimen of *I. praecox* was collected was sampled using the same methods in early December of 2012, and four other sites located upstream at approximately 86, 189, 382, and 613 m were sampled in early December 2012 and late July 2013. Despite the sampling efforts, only one specimen of *I. praecox* was collected, suggesting that this species may be uncommon in the river or occur primarily in other habitat types that were not sampled. Since our methods were not designed to collect particularly small fishes, it is also possible that our methodology was not effective for this species.

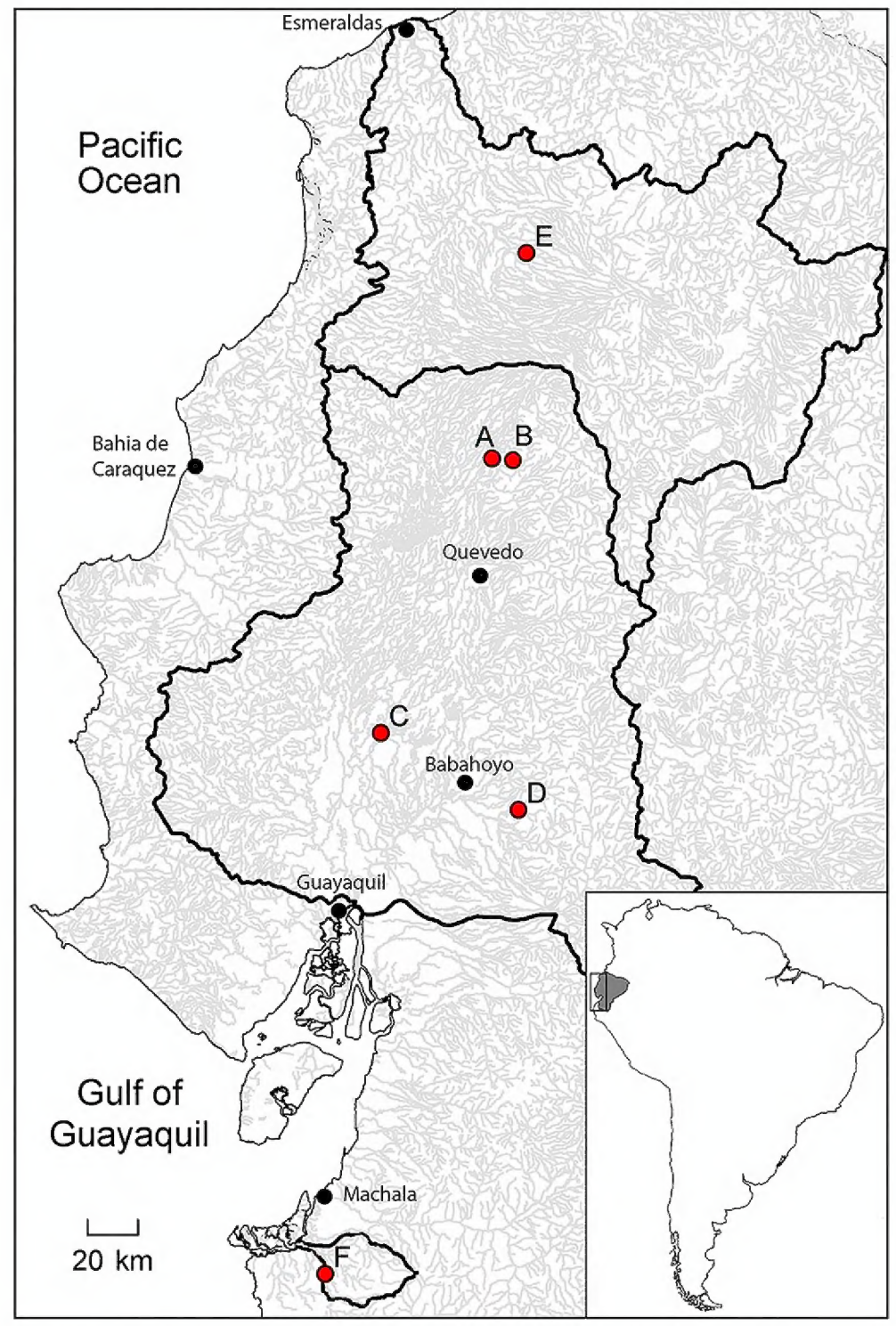

Figure 2. Map of part of Western Ecuador with the Esmeraldas (top), Guayas (middle), and Santa Rosa (bottom) drainages outlined. Red circles indicate sites with available records for *I. praecox*. A = Río Palenque Biological Reserve, B = Bimbe River locality, C = Vinces locality, D = Bolivar Province locality, E = Silanchi River locality, F = Santa Rosa River locality. Inset indicates position of Ecuador (filled) in South America and study area (rectangle) in Ecuador.

Figure 3. Habitat in which *Iotabrycon praecox* was collected in the Santa Rosa River with collection methodology illustrated.

Little is known about the ecology of *I. praecox* and public available collection records are sparse. We searched the Vertnet (http://vertnet.org/index.php) and Fishnet2 (http://fishnet2.net/) online databases using the search term "*Iotabrycon*". We also specifically searched the online collection databases for museums most likely to possess lots of *Iotabrycon* including the National Museum of Natural History of the United States (USNM), the Field Museum of Natural History (FMNH), the American Museum of Natural History (AMNH), the Museum of Comparative Zoology (MCZ), the University of Florida Natural History Museum (FLMNH), Scripps Institute of Oceanography (SIO), the British Museum of Natural History (BMNH), and the Museum National d' Histoire Naturelle of Paris (MNHN), using the same search term. Finally, collections of the species made by some of the authors (Aguirre unpublished data) available at the Museo de Ciencias Naturales, Universidad de Guayaquil (UG) were also included. The results are listed in Table 1.

Historically, *I. praecox* was known from only two localities, the type locality near the town of Vinces and the Río Palenque Biological Reserve, both forming part of the Guayas River drainage in the province of Los Ríos (Figure 2). *Iotabrycon praecox* was collected in isolated shallow pools close to the river at the Vinces locality (Roberts 1973), as well as in small forest streams (Glodek unpublished data) and in the main channel of the river at the Río Palenque Biological Reserve (Aguirre unpublished data). Aguirre and collaborators also collected several specimens at a site in the Bimbe River near the Río Palenque Biological Reserve in July 2008. Two additional records for the genus have recently become available at the Royal Ontario Museum of Natural History (ROM) based on collections conducted by Nathan Lujan and collaborators in 2012. One collection locality is in a stream in the Guayas drainage between the towns of San José del Tambo and Juan Montalvo in the province of Bolivar (Figure 2). More interestingly, another recent record appears as *Iotabrycon* sp. for specimens collected in the Silanchi River near the town of Silanchi in the province of Pichincha. Although not identified to species, this record indicates the presence of the genus in the Esmeraldas drainage basin and constitutes a northern range extension for the genus *Iotabrycon*. Clearly more work is needed to verify the true distribution of *Iotabrycon* in Ecuador but the records listed above indicate that the genus may occur over much of western Ecuador, from the Santa Rosa River drainage near Peru in the south to the Esmeraldas River drainage in the north.

We suspect that the small size of *I. praecox* may have hindered prior recognition of its occurrence outside of the Guayas River basin. *Iotabrycon praecox* is easily missed by non-specialists when mixed with larval or juvenile characids and would not be caught with the conventional fish collection methods used in the area, which are typically geared towards larger species. Our finding represents a significant range expansion for the species. If *I. praecox* is established in the Santa Rosa River, then it is likely also present in the other small coastal rivers between the Guayas and Santa Rosa rivers (Figure 2). Periodic flooding in the rainy season may facilitate fish movement among drainages in the region. It may also occur farther south than the Santa Rosa River since many fish species are shared between the Guayas River and the small coastal rivers in northern Peru (Ortega *et al.* 2011; Albert *et al.* 2011).

Given the degradation that rivers in the region are experiencing and the scarcity of records, the present status of *I. praecox* in the region warrants immediate evaluation. Sampling of other small coastal rivers in the area would provide a better understanding of the true distribution of this species and possibly allow prioritization of areas for directed conservation efforts. Deforestation, deterioration of water quality and river banks, pollution from human waste waters and agricultural and mining sources are all likely having a negative impact on the native fishes in the area including *I. praecox*.

Table 1. Museum records of *Iotabrycon*.

DRAINAGE	LOCALITY	RECORDS - MUSEUM[1]-CATALOG NUMBER (NUMBER OF SPECIMENS)
Guayas	Río Palenque Biological Reserve near town of Patricia Pilar in the Upper Guayas River Drainage	FMNH-79144(2), FMNH-79145(4), FMNH-79147(16), FMNH-79161(1), FMNH-79162(1), FMNH-79163(5), FMNH-79166(24), FMNH-81731(2), FMNH-81732(4), FMNH-81733(2), FMNH-92062(3), FMNH-94948(27), USNM-216802(36), USNM-236064 (17), USNM-216803(15), USNM-235946(0), MCZ-50611(5), MCZ-50602(9), UG-1492(1), UG-1493(1).
Guayas	Bimbe River in the Upper Guayas River Drainage	UG-1646(4)
Guayas	Río Nuevo, tributary of Río Vinces near city of Vinces	USNM-212065(5), MCZ-48659(14)
Guayas	Creek on road between San Jose del Tambo and Juan Montalvo in Bolivar Province	ROM-93759(11)
Esmeraldas	Río Silanchi downstream of the town of Silanchi	ROM-93676(3)
Santa Rosa	Santa Rosa River upstream of city of Santa Rosa	MECN-DP 2543(1)[2]

[1] Museum acronyms are listed in text. [2] This study.

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